FAKULTÄT FÜR WIRTSCHAFTSINFORMATIK
UND WIRTSCHAFTSMATHEMATIK

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Reinforcement Learning

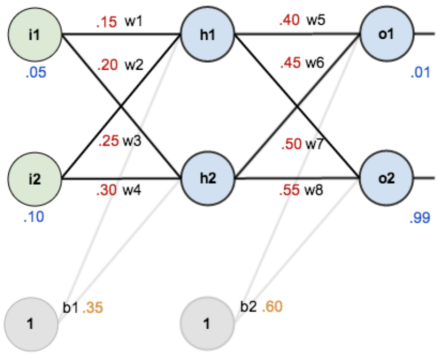
12. Exercise Sheet

1. Back propagation: Theory

Go through the proof of Theorem 5.3.8 and check that the gradient $\nabla_w F_w(x)$ is computed by $\frac{\partial}{\partial w^l_{i,j}} F_w(x)_m = \delta^l_{i,j} V^l_i$ with $\delta^L_{j,m} = \Phi'(h^L_j)$ if $j = m$ and zero else and $\delta^l_{j,m} = \sigma'(h^{l-1}_j) w^{l+1}_{j,m} \delta^{l+1}_{m,m}$.
Hint: Note that $\nabla_w F_w(x) \in R^k$, i.e. $\delta_{j,m}$ is with respect to the m-th koordinate of $\nabla_w F_w(x)$.

2. Back propagation: Praxis

Consider a neural network with two inputs, two hidden neurons, two output neurons:



The blue numbers are the training inputs/outputs, the red numbers are the weights and the orange numbers the biases. Calculate the forward passes and backward passes from Algorithm 33 in the lecture and update the weights.